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Wanaque Reservoir, Passaic County, New Jersey

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT

ON

WANAQUE RESERVOIR

PASSAIC COUNTY

NEW JERSEY

EPA REGION II

WORKING PAPER No. 376

WITH THE COOPERATION OF THE

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

AND THE

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MAY 1976

CONTENTS

	Page
Foreword	ii
List of Study Lakes - State of New Jersey	iv
Lake and Drainage Area Map	v
Sections	
I. Conclusions	1
II. Lake and Drainage Basin Characteristics	4
III. Lake Water Quality Summary	6
IV. Nutrient Loadings	10
V. Literature Reviewed	16
VI. Appendices	17

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by the U.S. Environmental Protection Agency and to augment plans implementation by the states.

ACKNOWLEDGMENTS

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the New Jersey Department of Environmental Protection for professional involvement and to the New Jersey National Guard for conducting the tributary sampling phase of the Survey.

Douglas Clark, Chief of the Bureau of Water Quality Planning and Management, Mr. Frank Takacs, New Jersey National Eutrophication Survey Coordinator, Principal Environmental Specialist, and Robert Kotch, Senior Environmental Engineer, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

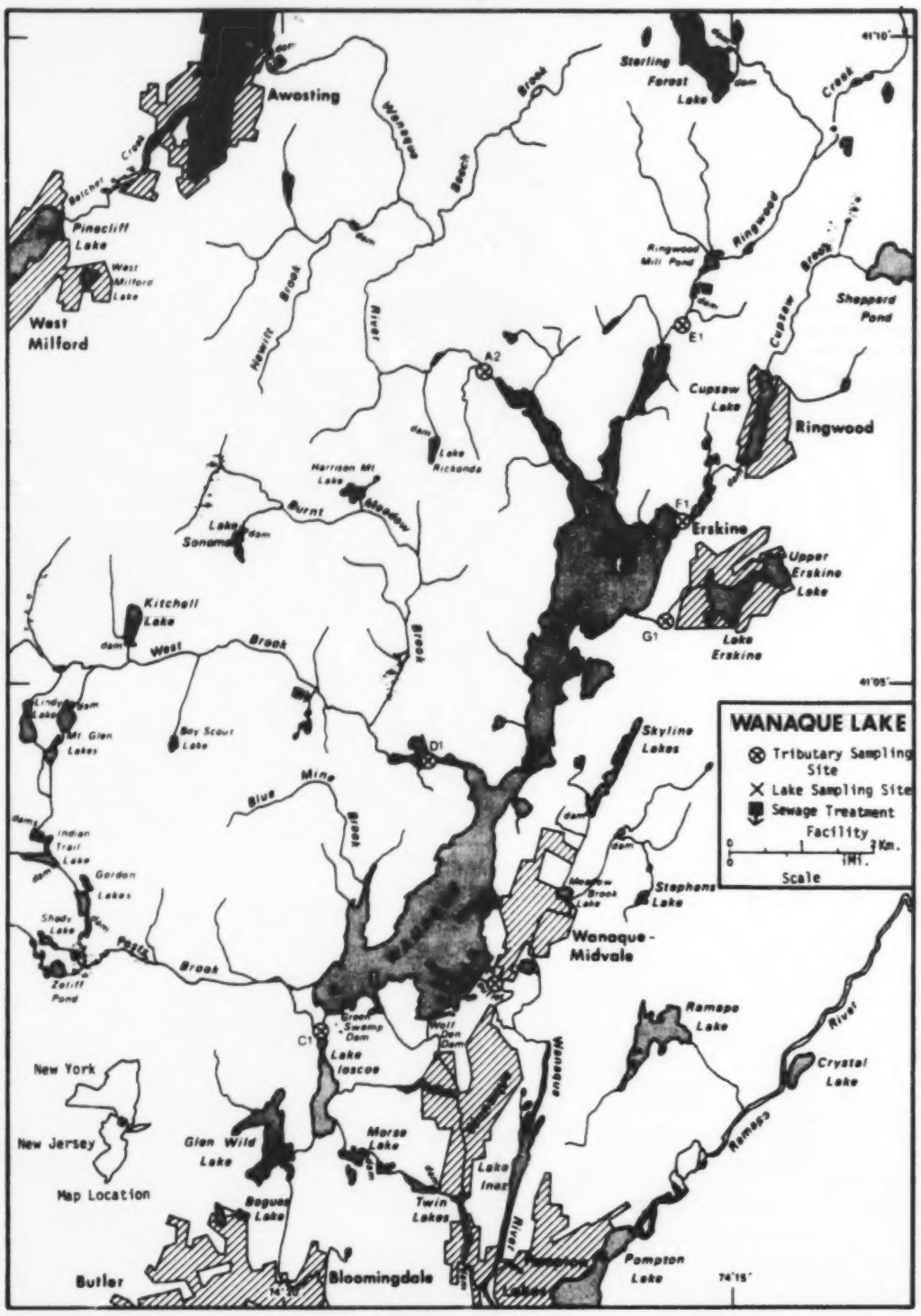
Major General William R. Sharp, Former Chief of Staff, Major General Wilfred G. Menard, Jr., Chief of Staff, and Project Officer Colonel Herbert D. Ruhlin, who directed the volunteer efforts of the New Jersey National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF NEW JERSEY

LAKE NAME	COUNTY
Budd Lake	Morris
Duhernal Lake	Middlesex
Farrington Lake	Middlesex
Greenwood Lake	Passaic, N.J.; Orange, N.Y.
Lake Hopatcong	Morris, Sussex
Lake Musconetcong	Morris, Sussex
Oradell Reservoir	Bergen
Paulinskill Lake	Sussex
Pinecliff Lake	Passaic
Pompton Lakes	Passaic
Spruce Run Reservoir	Hunterdon
Union Lake	Cumberland
Wanaque Reservoir	Passaic


WANAQUE LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Scale
3 Km.
1 MI.
Awosting
Sterling Forest Lake
West Milford
Pinecliff Lake
West Milford Lake
Ringwood
Ringwood Mill Pond
Shepperd Pond
Cupsaw Lake
Lake Richards
Harrison Mt Lake
Lake Sonoma
Erskine
Upper Erskine Lake
Lake Erskine
Kitchell Lake
Mt Glen Lakes
Boy Scout Lake
Skyline Lakes
Indian Trail Lake
Gordon Lakes
Shady Lake
Zaliff Pond
Meadow Brook Lake
Stephens Lake
Wanaque - Midvale
Ramapo Lake
Crystal Lake
Lake Iosco
New York
New Jersey
Map Location
Glen Wild Lake
Morse Lake
Lake Inez
Bogus Lake
Twin Lakes
Butler
Bloomingdale
Pompton Lake
Wanaque River
Ramapo River
Burnt Meadow Brook
Hewitt Brook
Wanaque River
Blue Mine Brook
Peters Brook
41°10'
41°05'
74°15'

WANAQUE RESERVOIR, NEW JERSEY

STORET NO. 3423

I. CONCLUSIONS

A. Trophic Condition:

Based on Survey data and field observations, Wanaque Reservoir is considered mesotrophic. Secchi disc readings had a mean of 367 cm, and Survey limnologists reported no algal blooms or problem aquatic macrophytes. Chlorophyll a values ranged from a low of 3.5 µg/l in the fall to a high of 12.2 µg/l in the summer. The potential for primary productivity as measured by algal assay control yield was low. Of the 13 New Jersey lakes sampled in 1973, 100% had higher median total phosphorus values and 87% had higher median inorganic nitrogen values than Wanaque Reservoir.

B. Rate-Limiting Nutrient:

The algal assay results are not considered reliable because of a significant change in nutrients from the time the sample was collected until the assay was begun. However, mean total inorganic nitrogen to mean orthophosphorus ratios (N/P) ir the lake data indicate phosphorus limitation at all sampling times.

C. Nutrient Controllability:

1. Point Sources -

The mean annual load from point sources was estimated to be 9.7% of the total reaching Wanaque Reservoir. The Awosting section of West Milford Township wastewater treatment plant contributed 8.5% of the total load. It should be noted, however, that during normal flow periods the plant does not discharge directly into the Wanaque River, but rather goes into an old bed and percolates into subsurface waters. Only during heavy runoff periods does the flow exceed infiltration, and thus discharge into the Wanaque River. Annual estimates for loading from this plant into Wanaque Reservoir, then, are probably too high (Dean C. Noll, personal communication).

The calculated phosphorus loading of 0.40 g $P/m^2/yr$ for Wanaque Reservoir was slightly below the "permissible" (oligotrophic) loading proposed by Vollenweider (Vollenweider and Dillon, 1974) for lakes with such volume and retention time. However, in view of the apparent nitrogen export and very low phosphorus accumulation in Wanaque Reservoir, and the high nutrient exports for tributary G(1) (Unnamed Stream), it is possible that unknown nutrient sources

may be reaching the lake, making the loading value of 0.40 $g/m^2/yr$ too low. Additional study of the reservoir's nutrient budget is needed before recommendations on nutrient controllability can be proposed.

2. Nonpoint Sources -

Nonpoint sources contributed 90.3% of the phosphorus load reaching Wanaque Reservoir. Measured tributaries accounted for 65.5% of the total phosphorus load and the ungaged tributaries were estimated to contribute 20.4% of the load.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below. The lake surface area and mean depth were provided by the State of New Jersey. Tributary flow data were provided by the New Jersey District Office of the U.S. Geological Survey (USGS)(outlet drainage area includes the lake surface area). Mean hydraulic retention time was obtained by dividing the lake volume by the mean flow of the outlet. The mean flow of the outlet includes the flow diverted from Wanaque Reservoir for a municipal water supply. The sum of the tributary flow does not equal the outlet flow probably because of either sampling error, unmeasured groundwater influence, or unknown inputs reaching the lake. Precipitation values are estimated by methods as outlined in National Eutrophication Survey (NES) Working Paper No. 175. A table of metric/English conversions is included as Appendix A.

A. Lake Morphometry:

1. Surface area: 9.35 km^2.
2. Mean depth: 11.3 meters.
3. Maximum depth: 27.4 meters.
4. Volume: 105.655 x 10^6 m^3.
5. Mean hydraulic retention time: 218 days.

B. Tributary and Outlet (see Appendix B for flow data):

1. Tributaries -

Name	Drainage area(km^2)	Mean flow (m^3/sec)
A(2) Wanaque River	104.6	2.19
D(1) West Brook	30.6	0.64
E(1) Ringwood Creek	49.5	0.89
F(1) Cupsaw Brook	11.3	0.21
G(1) Unnamed Stream	2.3	0.05
Minor tributaries and immediate drainage -	26.4	0.76
Totals	224.7	4.74

2. Outlet

A(1) Wanaque River	234.1	1.17
Diversion canal	---	4.44
Totals	234.1	5.61

C. Precipitation:*

1. Year of sampling: 142.7 cm.

2. Mean annual: 120.4 cm.

*Dean C. Noll, personal communication.

III. LAKE WATER QUALITY SUMMARY

Wanaque Reservoir was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake and from a number of depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll a analysis and phytoplankton identification and enumeration. During the first visit, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 23.5 meters at Station 1, 17.4 meters at Station 2, and 14.0 meters at Station 3. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix C and are summarized in III A for waters at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll a determinations are included in III B. Results of the limiting nutrient study are present in III C.

MANAGUE RESERVOIR
STORET CODE 3423

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	(4/17/73) S*** = 3 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	(7/22/73) S*** = 3 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	(10/ 1/73) S*** = 3 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)
TEMPERATURE (DEG CENT)												
0.-1.5 M DEPTH	6	8.5- 10.0	9.4	0.0- 1.2	6	24.8- 25.5	25.0	0.0- 1.5	5	19.9- 20.5	20.3	0.0- 1.5
MAX DEPTH**	3	7.5- 8.7	8.7	7.9- 20.7	3	7.0- 10.0	8.4	14.0- 23.5	3	8.6- 15.0	10.4	10.7- 21.3
DISSOLVED OXYGEN (MG/L)												
0.-1.5 M DEPTH	3	11.8- 12.4	12.0	1.2- 1.2	3	8.4- 12.6	8.8	1.5- 1.5	3	7.8- 8.4	8.0	1.5- 1.5
MAX DEPTH**	3	11.5- 11.8	11.8	7.9- 20.7	3	0.6- 2.0	2.0	14.0- 23.5	3	0.2- 0.5	0.4	10.7- 21.3
CONDUCTIVITY (UMHOS)												
0.-1.5 M DEPTH	6	80.- 85.	81.	0.0- 1.2	6	70.- 72.	71.	0.0- 1.5	6	160.- 170.	160.	0.0- 1.5
MAX DEPTH**	3	78.- 80.	80.	7.9- 20.7	3	49.- 55.	51.	14.0- 23.5	3	180.- 200.	200.	10.7- 21.3
PH (STANDARD UNITS)												
0.-1.5 M DEPTH	6	7.4- 7.6	7.4	0.0- 1.2	6	7.1- 7.4	7.2	0.0- 1.5	6	6.5- 7.3	6.6	0.0- 1.5
MAX DEPTH**	3	7.4- 7.4	7.4	7.9- 20.7	3	6.0- 6.1	6.0	14.0- 23.5	3	6.2- 6.4	6.3	10.7- 21.3
TOTAL ALKALINITY (MG/L)												
0.-1.5 M DEPTH	6	10.- 13.	12.	0.0- 1.2	6	12.- 15.	13.	0.0- 1.5	6	12.- 18.	13.	0.0- 1.5
MAX DEPTH**	3	10.- 14.	14.	7.9- 20.7	3	12.- 17.	14.	14.0- 23.5	3	21.- 22.	22.	10.7- 21.3
TOTAL P (MG/L)												
0.-1.5 M DEPTH	6	0.012-0.016	0.014	0.0- 1.2	6	0.009-0.018	0.012	0.0- 1.5	6	0.012-0.021	0.014	0.0- 1.5
MAX DEPTH**	3	0.012-0.015	0.014	7.9- 20.7	3	0.011-0.016	0.012	14.0- 23.5	3	0.017-0.026	0.025	10.7- 21.3
DISSOLVED ORTHO P (MG/L)												
0.-1.5 M DEPTH	6	0.002-0.006	0.005	0.0- 1.2	6	0.005-0.008	0.008	0.0- 1.5	6	0.004-0.010	0.006	0.0- 1.5
MAX DEPTH**	3	0.005-0.006	0.005	7.9- 20.7	3	0.007-0.014	0.009	14.0- 23.5	3	0.004-0.004	0.004	10.7- 21.3
NO2+NO3 (MG/L)												
0.-1.5 M DEPTH	6	0.090-0.100	0.090	0.0- 1.2	6	0.020-0.050	0.030	0.0- 1.5	6	0.020-0.040	0.025	0.0- 1.5
MAX DEPTH**	3	0.100-0.100	0.100	7.9- 20.7	3	0.270-0.300	0.290	14.0- 23.5	3	0.020-0.130	0.090	10.7- 21.3
AMMONIA (MG/L)												
0.-1.5 M DEPTH	6	0.030-0.040	0.030	0.0- 1.2	6	0.030-0.040	0.035	0.0- 1.5	6	0.030-0.060	0.040	0.0- 1.5
MAX DEPTH**	3	0.030-0.050	0.040	7.9- 20.7	3	0.040-0.060	0.050	14.0- 23.5	3	0.170-0.330	0.300	10.7- 21.3
KJELDAHL N (MG/L)												
0.-1.5 M DEPTH	6	0.200-0.500	0.350	0.0- 1.2	6	0.200-0.400	0.300	0.0- 1.5	6	0.400-1.000	0.650	0.0- 1.5
MAX DEPTH**	3	0.200-0.500	0.400	7.9- 20.7	3	0.200-0.200	0.200	14.0- 23.5	3	0.600-0.800	0.800	10.7- 21.3
SECCHI DISC (METERS)	3	2.1- 2.5	2.4		3	4.3- 4.9	4.9		3	3.7- 4.6	3.7	

* N = NO. OF SAMPLES
** MAXIMUM DEPTH SAMPLED AT EACH SITE
*** S = NO. OF SITES SAMPLED ON THIS DATE

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
04/17/73	1. Tabellaria	1,203
	2. Melosira	1,141
	3. Asterionella	1,103
	4. Fragilaria	652
	5. Flagellates	564
	Other genera	1,968
	Total	6,631
07/22/73	1. Flagellates	701
	2. Melosira	660
	3. Fragilaria	325
	4. Asterionella	132
	5. Peridinium	102
	Other genera	162
	Total	2,082
10/01/73	1. Flagellates	980
	2. Melosira	513
	3. Stephanodiscus	301
	4. Fragilaria	223
	5. Asterionella	100
	Other genera	178
	Total	2,295

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (µg/liter)
04/17/73	1	11.2
	2	8.0
	3	7.7
07/22/73	1	6.1
	2	6.3
	3	12.2
10/01/73	1	3.5
	2	4.3
	3	4.7

C. Limiting Nutrient Study:

The algal assay results are not considered reliable because of a significant change in the nutrient levels between the time the sample was collected and the assay was begun. However, the N/P ratio of 27/1 in the spring lake chemistry sample indicates phosphorus limitation at that time. The N/P ratio for the entire year of sampling was 24/1, also indicating phosphorus limitation.

IV. NUTRIENT LOADINGS
(See Appendix D for data)

For the determination of nutrient loadings, the New Jersey National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of February and March when two samples were collected. Sampling was begun in July 1973, and was completed in July 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the New Jersey District Office of the USGS for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of the USGS computer program for calculating stream loadings. Nutrient loads indicated for tributaries are those measured minus known point source loads, if any. The total outlet load was calculated by multiplying the total outlet flow (mean flow of tributary A(1) plus mean flow of the diversion canal) times the concentration measured at Station A(1). This assumes that the nutrient concentration at A(1) is the same as that flowing out of the aqueduct.

Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of USGS) were estimated by using the mean annual concentrations in Cupsaw Brook at Station F(1) and mean annual ZZ flow.

The operators of the Awosting and Robert Erskine School wastewater treatment plants provided monthly effluent samples and corresponding flow data. The West Milford School wastewater treatment plant provided monthly effluent samples. Nutrient loads were estimated using the mean nutrient concentration of the samples collected and an estimated mean instantaneous flow of 0.008 MGD which was provided by the plant operator.

A. Waste Sources:

1. Known municipal -

Name	Population Served *	Treatment*	Mean Flow ($m^3/d \times 10^3$)	Receiving Water *
Awosting	540	1.	0.167	Wanaque River
West Milford High School	241	2.	0.030	West Brook
Robert Erskine School	132	3.	0.017	Ringwood Creek

Key:
1. Tertiary
2. Sand filter
3. Primary clarification

*Treatment plant questionnaires.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/yr	% of total
a. Tributaries (nonpoint load) -		
A(2) Wanaque River	1,540	41.2
D(1) West Brook	250	6.7
E(1) Ringwood Creek	330	8.8
F(1) Cupsaw Brook	195	5.2
G(1) Unnamed Stream	135	3.6
b. Minor tributaries and immediate drainage (nonpoint load) -	765	20.4
c. Municipal STP's -		
Awosting	320	8.5
West Milford High School	15	0.4
Robert Erskine School	30	0.8
d. Septic tanks - None		
e. Known industrial - None		
f. Direct precipitation* -	165	4.4
Total	3,745	100.0

2. Outputs - A(1) Wanaque River 3,360

3. Net annual P accumulation 385

*Estimated (see Nes Working Paper No. 175).

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (nonpoint load) -		
A(2) Wanaque River	43,425	40.7
D(1) West Brook	10,475	9.8
E(1) Ringwood Creek	17,920	16.8
F(1) Cupsaw Brook	4,255	4.0
G(1) Unnamed Stream	2,625	2.5
b. Minor tributaries and immediate drainage (nonpoint load) -	16,535	15.5
c. Municipal STP's -		
Awosting	1,110	1.0
West Milford High School	125	0.1
Robert Erskine School	70	0.1
d. Septic tanks - None		
e. Known industrial - None		
f. Direct precipitation* -	10,095	9.5
Total	106,635	100.0
2. Output - A(1) Wanaque River	148,785	
3. Net annual N export** -	42,150	

*Estimated (see NES Working Paper No. 175).
**Estimated export probably due to unknown sources and/or sampling error.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
A(2) Wanaque River	15	415
D(1) West Brook	8	342
E(1) Ringwood Creek	7	362
F(1) Cupsaw Brook	17	377
G(1) Unnamed Stream	59*	1,141*

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Yearly Phosphorus Loading (g/m²/yr)
Estimated loading for Wanaque Reservoir	0.40
Vollenweider's "dangerous" or eutrophic loading	0.83
Vollenweider's "permissible" or oligotrophic loading	0.42

* Background levels for this tributary probably inflated by unknown point source influences from the city of Erskine.

V. LITERATURE REVIEWED

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U.S. Environmental Protection Agency. 1975. National Eutrophication Survey Methods 1973-1976. Working Paper No. 175. Environmental Monitoring and Support Laboratory, Las Vegas, Nevada and Corvallis Environmental Research Laboratory, Corvallis, Oregon.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

VI. APPENDICES

APPENDIX A

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX B

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR NEW JERSEY 06/04/76

LAKE CODE 3423 WANAQUE RESERVOIR

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 234.1

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
3423A1	234.1	0.57	0.99	3.11	2.46	1.98	1.95	0.68	0.42	0.42	0.54	0.40	0.54	1.17
3423A2	104.6	2.78	2.72	4.59	3.88	2.32	1.27	0.96	1.10	0.88	1.02	2.10	2.72	2.19
3423C1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3423D1	30.6	0.79	0.79	1.36	1.10	0.68	0.37	0.25	0.28	0.27	0.34	0.68	0.82	0.64
3423E1	49.5	1.08	1.10	1.98	1.67	1.02	0.57	0.40	0.40	0.31	0.40	0.79	1.08	0.89
3423F1	11.3	0.266	0.269	0.481	0.396	0.215	0.091	0.054	0.062	0.059	0.082	0.215	0.278	0.205
3423G1	2.3	0.059	0.059	0.105	0.085	0.051	0.028	0.020	0.023	0.020	0.025	0.051	0.062	0.049
3423ZZ	35.7	0.93	0.93	1.59	1.30	0.79	0.42	0.31	0.34	0.31	0.40	0.79	0.96	0.76

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 234.1
SUM OF SUB-DRAINAGE AREAS = 234.1
TOTAL FLOW IN = 56.93
TOTAL FLOW OUT = 14.07

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3423A1	7	73	4.729	21	0.708				
	8	73	0.538	25	0.481				
	9	73	0.481	8	0.510				
	10	73	0.510	14	0.481				
	11	73	0.481	4	0.481				
	12	73	0.595	1	0.481				
	1	74	0.538	20	0.538				
	2	74	0.566	3	0.566	24	0.623		
	3	74	3.115	3	0.680	30	4.361		
	4	74	9.288	7	11.751				
	5	74	2.549	12	1.359				
	6	74	0.680	1	1.444				
3423A2	7	73	3.171	21	1.642				
	8	73	0.481	25	0.224				
	9	73	0.198	8	0.181				
	10	73	0.190	14	0.153				
	11	73	0.481	4	0.566				
	12	73	7.221	1	1.303				
	1	74	3.398	20	1.897				
	2	74	2.492	3	3.540	24	3.879		
	3	74	3.426	3	2.690	30	3.200		
	4	74	4.729	7	6.173				
	5	74	2.605	12	3.964				
	6	74	1.218	1	2.209				

TRIBUTARY FLOW INFORMATION FOR NEW JERSEY 06/04/76

LAKE CODE 3423 WANAQUE RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3423C1	7	73	0.0	21	0.0				
	8	73	0.0	25	0.0				
	9	73	0.0	8	0.0				
	10	73	0.0	14	0.0				
	11	73	0.0	4	0.0				
	12	73	0.0	1	0.0				
	1	74	0.0	20	0.0				
	2	74	0.0	3	0.0	24	0.0		
	3	74	0.0	3	0.0	30	0.0		
	4	74	0.0	7	0.0				
	5	74	0.0	12	0.0				
	6	74	0.0	1	0.0				
342301	7	73	0.510	21	0.566				
	8	73	0.110	25	0.054				
	9	73	0.057	8	0.042				
	10	73	0.156	14	0.054				
	11	73	0.153	4	0.156				
	12	73	1.614	1	0.241				
	1	74	0.991	20	0.538				
	2	74	0.736	3	0.765	24	1.161		
	3	74	1.133	3	0.708	30	0.906		
	4	74	1.388	7	1.472				
	5	74	0.821	12	1.416				
	6	74	0.340	1	0.991				
3423E1	7	73	1.133	21	0.736				
	8	73	0.224	25	0.110				
	9	73	0.079	8	0.057				
	10	73	0.153	14	0.059				
	11	73	0.164	4	0.195				
	12	73	2.917	1	0.283				
	1	74	1.699	20	0.680				
	2	74	1.133	3	1.501	24	1.557		
	3	74	1.614	3	1.161	30	1.642		
	4	74	2.265	7	2.747				
	5	74	1.189	12	2.067				
	6	74	0.425	1	1.416				
3423F1	7	73	0.142	21	0.164				
	8	73	0.017	25	0.006				
	9	73	0.006	8	0.006				
	10	73	0.025	14	0.006				
	11	73	0.025	4	0.025				
	12	73	0.566	1	0.051				
	1	74	0.368	20	0.153				
	2	74	0.238	3	0.252	24	0.425		
	3	74	0.425	3	0.227	30	0.340		
	4	74	0.510	7	0.538				
	5	74	0.278	12	0.510				
	6	74	0.082	1	0.368				

TRIBUTARY FLOW INFORMATION FOR NEW JERSEY 06/04/76

LAKE CODE 3423 WANAQUE RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3423G1	7	73	0.040	21	0.042				
	8	73	0.008	25	0.003				
	9	73	0.006	8	0.003				
	10	73	0.011	14	0.003				
	11	73	0.011	4	0.011				
	12	73	0.122	1	0.017				
	1	74	0.076	20	0.040				
	2	74	0.057	3	0.059	24	0.088		
	3	74	0.088	3	0.054	30	0.068		
	4	74	0.105	7	0.113				
	5	74	0.062	12	0.108				
	6	74	0.025	1	0.076				
3423ZZ	7	73	0.595	21	0.651				
	8	73	0.130	25	0.062				
	9	73	0.065	8	0.051				
	10	73	0.181	14	0.062				
	11	73	0.178	4	0.181				
	12	73	1.897	1	0.283				
	1	74	1.161	20	0.623				
	2	74	0.850	3	0.906	24	1.359		
	3	74	1.331	3	0.821	30	1.048		
	4	74	1.614	7	1.727				
	5	74	0.963	12	1.671				
	6	74	0.396	1	1.161				

APPENDIX C

PHYSICAL AND CHEMICAL DATA

STORET RETRIEVAL DATE 76/06/04

342301
41 02 45.0 074 17 53.0 3
WANAQUE RESERVOIR
34031 NEW JERSEY
013391

11EPALES 2111202
0072 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/17	10 50	0000	8.5		100	85	7.60	10K	0.040	0.300	0.100	0.006
	10 50	0004	8.5	11.8		82	7.60	10K	0.030	0.400	0.090	0.006
	10 50	0024	8.3	12.3		80	7.50	10	0.030	0.200K	0.100	0.005
	10 50	0040	7.8	11.8		80	7.50	11	0.040	0.200K	0.100	0.005
	10 50	0068	7.5	11.8		80	7.40	10	0.040	0.200K	0.100	0.006
73/07/22	12 40	0000	24.9		192	70	7.30	14	0.030	0.400	0.030	0.008
	12 40	0005	24.8	12.6		71	7.20	12	0.030	0.400	0.030	0.007
	12 40	0015	24.8	8.2		71	7.10	12	0.030	0.400	0.030	0.012
	12 40	0025	20.3	6.8		65	6.40	13	0.040	0.200	0.020	0.005
	12 40	0040	12.1	5.8		57	6.20	14	0.050	0.200K	0.080	0.006
	12 40	0055	8.1	4.4		51	6.10	14	0.030	0.200K	0.230	0.006
	12 40	0077	7.8	2.8		49	6.00	17	0.050	0.200K	0.380	0.014
73/10/01	11 15	0000	20.5		102	170	7.30	18	0.040	0.700	0.030	0.008
	11 15	0005	20.4	8.4		160	6.90	14	0.030	0.600	0.020	0.005
	11 15	0015	20.4	8.2		160	6.80	13	0.030	0.600	0.020	0.004
	11 15	0040	11.5	0.6		170	6.50	16	0.030	0.500	0.220	0.004
	11 15	0050	9.8	0.4		180	6.20	14	0.030	0.500	0.240	0.004
	11 15	0070	8.6	0.2		200	6.30	22	0.330	0.800	0.130	0.004

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/17	10 50	0000	0.015	11.2
	10 50	0004	0.012	
	10 50	0024	0.012	
	10 50	0040	0.012	
	10 50	0068	0.014	
73/07/22	12 40	0000	0.018	6.1
	12 40	0005	0.015	
	12 40	0015	0.020	
	12 40	0025	0.014	
	12 40	0040	0.013	
	12 40	0055	0.013	
	12 40	0077	0.016	
73/10/01	11 15	0000	0.014	3.5
	11 15	0005	0.013	
	11 15	0015	0.011	
	11 15	0040	0.011	
	11 15	0050	0.014	
	11 15	0070	0.017	

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

342302
41 04 20.0 074 17 16.0 3
WANAQUE RESERVOIR
34031 NEW JERSEY
013391

11EPALES 2111202
0030 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/17	12 20	0000	9.4		96	80	7.50	11	0.030	0.200K	0.090	0.003
	12 20	0004	9.4	12.4		80	7.40	12	0.030	0.200K	0.100	0.005
	12 20	0026	8.7	11.8		78	7.40	14	0.030	0.400	0.100	0.005
73/07/22	13 20	0000	25.5		192	72	7.10	15	0.040	0.300	0.050	0.008
	13 20	0005	25.1	8.8		72	7.10	15	0.040	0.200	0.040	0.008
	13 20	0015	24.9	8.4		72	7.00	13	0.040	0.300	0.040	0.006
	13 20	0030	18.2	5.2		62	6.30	14	0.070	0.200	0.070	0.007
	13 20	0057	8.4	0.6		51	6.00	14	0.060	0.200K	0.290	0.007
73/10/01	10 45	0000	20.3		144	160	6.60	12	0.040	0.700	0.020	0.004
	10 45	0005	20.2	8.0		160	6.50	12	0.040	0.500	0.030	0.004
	10 45	0023	20.2	8.0		160	6.50	17	0.030	0.500	0.030	0.004
	10 45	0032	18.8	4.6		160	6.40	18	0.040	0.600	0.030	0.004
	10 45	0044	10.4	0.4		180	6.20	21	0.170	0.600	0.090	0.004

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/17	12 20	0000	0.014	8.0
	12 20	0004	0.014	
	12 20	0026	0.012	
73/07/22	13 20	0000	0.009	6.3
	13 20	0005	0.013	
	13 20	0015	0.012	
	13 20	0030	0.010	
	13 20	0057	0.012	
73/10/01	10 45	0000	0.014	4.3
	10 45	0005	0.012	
	10 45	0023	0.011	
	10 45	0032	0.013	
	10 45	0044	0.026	

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

342303
41 05 59.0 074 16 34.0 3
WANAQUE RESERVOIR
34031 NEW JERSEY
013391

11EPALES 2111202
0047 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/17	12 45	0000	10.0		84	82	7.40	13	0.040	0.500	0.090	0.002
	12 45	0004	9.8	12.0		80	7.40	13	0.030	0.500	0.090	0.006
	12 45	0024	9.2	11.6		80	7.30	14	0.040	0.500	0.090	0.005
	12 45	0043	8.7	11.5		80	7.40	14	0.050	0.500	0.100	0.005
73/07/22	13 50	0000	25.2		168	71	7.40	12	0.040	0.300	0.020	0.005
	13 50	0005	25.0	8.4		71	7.30	12	0.030	0.200	0.020	0.006
	13 50	0015	23.5	7.2		72	6.60	12	0.040	0.300	0.030	0.006
	13 50	0030	17.8	3.6		63	6.20	11	0.090	0.300	0.070	0.005
	13 50	0046	10.0	2.0		55	6.10	12	0.040	0.200	0.270	0.009
73/10/01	10 05	0000	19.9		144	170	6.60	14	0.060	1.000	0.040	0.010
	10 05	0005		7.8		160	6.50	12	0.040	0.400	0.020	0.007
	10 05	0023	19.6	7.6		160	6.40	13	0.040	0.500	0.020	0.005
	10 05	0035	15.0	0.5		200	6.40	22	0.300	0.800	0.020	0.004

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/17	12 45	0000	0.016	7.7
	12 45	0004	0.015	
	12 45	0024	0.014	
	12 45	0043	0.015	
73/07/22	13 50	0000	0.010	12.2
	13 50	0005	0.011	
	13 50	0015	0.015	
	13 50	0030	0.012	
	13 50	0046	0.011	
73/10/01	10 05	0000	0.021	4.7
	10 05	0005	0.016	
	10 05	0023	0.015	
	10 05	0035	0.025	

APPENDIX D

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/06/04

3423A1
41 02 35.0 074 17 35.0 4
WANAQUE RIVER
34 7.5 WANAQUE
O/WANAQUE LAKE 013391
CO RD 511 BRDG BELO RAYMOND DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/21	11 45		0.200	1.260	0.077	0.005K	0.010
73/08/25	09 40		0.210	1.760	0.026	0.007	0.010
73/09/08	10 00		0.115	1.150	0.052	0.005K	0.010
73/10/14	09 37		0.086	0.750	0.058	0.006	0.010
73/11/04	10 00		0.100	0.250	0.037	0.005K	0.015
73/12/01	12 50		0.080	0.600	0.040	0.005K	0.020
74/01/20	10 30		0.240	0.100K	0.024	0.005K	0.005K
74/02/24	10 00		0.224	0.275	0.015	0.005K	0.020
74/03/03	09 30		0.192	0.300	0.015	0.005K	0.030
	09 45		0.300	0.200	0.020	0.005K	0.025
74/03/30	08 30		0.100	1.800	0.020	0.005K	0.030
74/04/07	10 00		0.068	0.300	0.015	0.005K	0.010
74/05/12	09 15		0.252	0.400	0.060	0.010	0.060
74/06/01	09 35		0.056	0.400	0.045	0.005	0.015

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

3423A2
41 07 20.0 074 17 49.0 4
WANAQUE RIVER
34 7.5 WANAQUE
T/WANAQUE LAKE 013391
BANK AT USGS GAGE 0.1 MI ABOV RESERVOIR
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/21	12	40	0.210	0.600	0.138	0.008	0.050
73/08/25	11	40	0.034	1.200	0.080	0.008	0.015
73/09/08	11	15	0.034	0.520	0.023	0.005K	0.020
73/10/14	12	00	0.010K	0.550	0.031	0.006	0.010
73/11/04	12	30	0.027	1.600	0.270	0.005K	0.020
73/12/01	11	40	0.052	0.225	0.012	0.005K	0.015
74/01/20	12	45	0.176	0.100K	0.040	0.005K	0.005
74/02/24	10	30	0.128	0.300	0.020	0.005	0.025
74/03/03	10	05	0.104	0.700	0.070	0.005K	0.035
	12	00	0.368	0.200	0.010	0.005	0.035
74/03/30	10	10	0.168	0.300	0.025	0.005K	0.020
74/04/07	11	17	0.024	0.500	0.020	0.005K	0.020
74/05/12	11	00	0.052	0.700	0.030	0.010	0.080
74/06/01	13	00	0.156	0.500	0.040	0.005	0.045

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

3423C1
41 02 16.0 074 19 20.0 4
UNNAMED STREAM
34 7.5 WANAQUE
O/WANAQUE LAKE 013391
BANK 0.1 MI N OF LK IOSCOE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/21	11 00		0.115	0.460	0.370	0.005K	0.010
73/08/25	09 15		0.131	1.400	0.018	0.006	0.010
73/09/08	09 45		0.115	0.630	0.096	0.005K	0.012
73/10/14	09 00		0.010K	0.650	0.032	0.007	0.015
73/11/04	09 30		0.012	0.100K	0.070	0.009	0.009
73/12/01	11 15		0.012	0.250	0.024	0.005K	0.020
74/01/20	10 15		0.072	0.100K	0.008	0.005K	0.005K
74/02/03	09 30		0.052	0.200	0.015	0.005K	0.005K
74/02/24	09 00		0.048	0.100K	0.010	0.005K	0.010
74/03/03	18 40		0.048	0.100K	0.010	0.005K	0.015
74/03/30	08 20		0.050	0.100	0.010	0.005K	0.005K
74/04/07	09 30		0.004	0.100K	0.015	0.005K	0.005K
74/05/12	08 00		0.032	0.300	0.025	0.005	0.015
74/06/01	09 15		0.088	0.500	0.060	0.005K	0.005K

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

342301
41 04 20.0 074 18 16.0 4
WEST BROOK
34 7.5 WANAQUE
T/WANAQUE LAKE 013391
WEST BROOK RD BRDG AT MOUTH
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/21	12 00		0.019	0.560	0.048	0.005K	0.015
73/08/25	10 00		0.010K	1.380	0.030	0.005K	0.010
73/09/08	10 15		0.010K	0.220	0.054	0.005K	0.010
73/10/14	10 00		0.160	1.050	0.038	0.008	0.010
73/11/04	10 30		0.154	0.250	0.047	0.005K	0.010
73/12/01	12 30		0.176	0.300	0.024	0.005K	0.010
74/01/20	10 45		0.340	0.100K	0.012	0.005K	0.005K
74/02/03	10 00		0.252	0.100K	0.010	0.005K	0.005K
74/02/24	10 10		0.252	0.100	0.015	0.005K	0.010
74/03/03	09 45		0.208	0.100K	0.010	0.005K	0.020
74/03/30	08 45		0.200	0.400	0.020	0.010	0.010
74/04/07	10 15		0.128	0.300	0.015	0.005	0.015
74/05/12	09 33		0.048	0.300	0.015	0.005	0.025
74/06/01	10 00		0.012	0.600	0.025	0.010	0.035

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

3423E1
41 07 44.0 074 15 46.0 4
RINGWOOD CREEK
34 7.5 GREENWOOD LK
T/WANAQUE LAKE 013292
RINGWOOD AVE BRDG E OF SLOATBURG RD
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/21	13 05		0.072	0.580	0.065	0.005K	0.020
73/08/25	11 25		0.023	1.200	0.014	0.005K	0.005K
73/09/08	11 00		0.034	0.420	0.105	0.005K	0.010
73/10/14	11 30		0.018	0.650	0.017	0.005K	0.005K
73/11/04	12 00		0.052	1.550	0.125	0.005K	0.015
73/12/01	11 50		0.060	0.250	0.012	0.005K	0.025
74/01/20	13 00		0.176	0.100K	0.016	0.005K	0.005K
74/02/03	11 30		0.116	2.100	0.460	0.005K	0.005
74/02/24	11 20		0.132	0.200	0.015	0.005K	0.020
74/03/03	11 00		0.108	0.100K	0.020	0.005K	0.025
74/03/30	09 40		0.084	0.100	0.015	0.005	0.010
74/04/07	11 00		0.062	0.400	0.010	0.005K	0.010
74/05/12	10 20		0.044	0.400	0.020	0.005	
74/06/01	11 55		0.064	0.400	0.020	0.005K	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

3423F1
41 06 37.0 074 15 10.0 4
CUPSAW BROOK
34 7.5 WANAQUE
T/WANAQUE LAKE 013391
CO RD 511 BRDG N OF SKYLINE RD JCT
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/21	12 25		0.021	0.660	0.086	0.005K	0.045
73/08/25	10 45		0.220	1.540	0.150	0.018	0.030
73/09/08	10 15		0.180	0.760	0.200	0.011	
73/10/14	11 00		0.126		0.240	0.014	0.060
73/11/04	11 30		0.084	0.600	0.090	0.007	0.040
73/12/01	11 30		0.024	0.500	0.032	0.008	0.035
74/01/20	12 30		0.410	0.200	0.016	0.005K	0.010
74/02/03	11 00		0.136	0.300	0.045	0.010	0.015
74/02/24	11 50		0.360	0.400	0.010	0.005	0.030
74/03/03	12 00		0.300	0.600	0.015	0.010	0.040
74/03/30	09 20		0.192	0.500	0.010	0.005	0.025
74/04/07	10 00		0.176	0.450	0.015	0.005K	0.025
74/05/12	10 10		0.044	0.750	0.030	0.005	
74/06/01	10 15		0.036	0.600	0.025	0.005	0.025

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

3423G1
41 05 30.0 074 16 10.0 4
UNNAMED STREAM
34 7.5 WANAQUE
T/WANAQUE LAKE 013391
SKYLINE DR BRDG 0.2 MI E OF CO RD 511JCT
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/21	12 15		0.180	2.205	0.060	0.027	0.250
73/11/04	11 00		1.480	2.300	0.195	0.013	0.115
74/01/20	11 00		1.700	0.100K	0.008	0.005K	0.030
74/02/03	10 30		2.100	0.100	0.015	0.015	0.020
74/02/24	10 45		0.410	0.300	0.010	0.005	0.030
74/03/03	12 30		0.340	0.200	0.035	0.005	0.045
74/03/30	09 10		0.280	0.500	0.015	0.010	0.040
74/04/07	10 30		0.276	0.400	0.020	0.005	0.025
74/05/12	10 23		1.300	1.400	0.125	0.060	0.270
74/06/01	11 00		1.010	0.500	0.045	0.035	0.050

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

3423AA AS3423AA P000540
41 09 30.0 074 20 00.0 4
AWOSTING
34 7.5 GREENWOOD LA
T/WANAQUE RESERVOIR 013292
WANAQUE RIVER
11EPALES 2141204
0000 FEET DEPTH CLASS 00

W Q	DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
	73/07/30	10 00		8.400		0.093	5.800	5.800	0.037	0.040
	73/08/29	09 45				0.012	6.500	7.200	0.031	0.034
	73/09/27	10 00		22.000	0.520	0.520	7.450	7.450	0.031	0.034
	73/10/26			23.000	0.500K	0.010K	7.750	7.750	0.029	0.033
	73/11/23	10 00		20.200	0.100K	0.014	7.000	7.200	0.029	0.037
	73/12/26	09 20		11.000	2.870	0.120	2.862	2.900	0.050	0.055
	74/01/24	10 00		11.200	0.500K	0.040K	3.300	3.300	0.067	0.052
	74/02/20	10 30		19.200	1.000K	0.100	5.700	6.000	0.075	0.050
	74/03/27	10 00		13.000	1.000K	0.050	3.900	4.150	0.045	0.050
	74/04/26	10 00		15.200	1.000K	0.120	4.200	4.500	0.042	0.063
	74/05/30	10 00		19.200	1.400	0.081	4.800	5.200	0.040	0.045
	74/06/20	10 00		17.000	1.200	0.120	4.406	4.600	0.040	0.043
	74/07/25	10 00		20.000	1.000K	0.120	5.100	5.400	0.030	0.038

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

34230A SF34230A P000241
41 04 45.0 074 19 39.0 4
WEST MILFORD HIGH SCHOOL
34 7.5 WANAQUE
T/WANAQUE LAKE 013391
WEST BROOK TRIBUTARY TO NOSENZO'S POND
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/01/02	10 15		3.840	0.500K	0.065	0.380	0.435		
74/02/21			25.200	1.000K	0.130	2.800	2.800		
74/03/06			36.000	1.000K	0.160	4.100	4.300		
74/04/17			3.360	1.000K	0.140	0.510	0.540		
74/05/15			24.000	1.000K	0.050K	4.600	5.200		
74/06/04			8.600	2.400	0.050K	1.200	1.260		
74/07/17	09 00		2.105	1.000K	0.450	0.020	0.025	0.008	
74/08/14			2.320	1.000K	0.070	0.050	0.050		
74/09/11			4.400	2.500		0.600	0.605		
74/10/16			2.100	1.000K	0.700	0.275	0.590		
74/11/13			6.000	1.000K	0.310	0.546	0.813		
74/12/10			3.520	4.800	0.160	1.350	1.900		
75/01/10			2.400	3.800	0.070	0.750	0.930		

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/06/04

3423XA PR3423XA P000132
41 08 00.0 074 15 52.0 4
ROBERT ERSKINE SCHOOL (WAYNE)
34 7.5 GREENWOOD LA
T/WANAQUE RESERVOIR 013292
RINGWOOD CREEK/WANAQUE RIVE
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/08/08	11 00								
CP(T)-			3.100	6.900	0.360	0.960	1.680	0.001	0.001
73/08/08	16 00								
73/09/12	11 45		9.700	2.800	2.040	5.400	5.600	0.004	0.004
73/10/10	11 00								
CP(T)-			11.400	0.110	0.110	6.100	6.100	0.005	0.005
73/10/10	16 00								
73/11/10	11 00								
CP(T)-			11.000	0.150	0.150	3.945	7.100	0.003	0.006
73/11/10	16 00								
73/12/26	11 30								
CP(T)-			1.800	15.000	0.750	1.760	5.200	0.001	0.006
73/12/26	16 30								
74/03/13	11 00								
CP(T)-			1.320	8.900	2.900	3.000	3.400	0.005	0.005
74/03/13	16 00								
74/05/08	11 00								
CP(T)-			7.400	3.500	0.380	3.700	4.000	0.005	0.005
74/05/08	16 00								
74/07/03	11 00								
CP(T)-			2.500	8.300	2.600	3.300	3.300	0.002	0.004
74/07/03	16 00								

APPENDIX E

PARAMETRIC RANKINGS OF LAKES SAMPLED BY NES IN 1973

STATE OF NEW JERSEY

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
3402	BUDD LAKE	0.082	0.205	474.000	48.500	7.400	0.012
3403	GREENWOOD LAKE	0.021	0.100	414.250	11.920	14.800	0.007
3406	ORADELL RESERVOIR	0.055	0.990	462.500	22.267	13.600	0.008
3409	PINECLIFF LAKE	0.070	0.175	465.500	38.960	11.000	0.011
3410	POMPTON LAKES	0.071	0.795	463.167	23.033	11.800	0.029
3412	DUHERNAL LAKE	0.082	1.420	466.667	6.800	8.600	0.010
3413	FARRINGTON LAKE	0.055	0.770	462.000	8.283	14.400	0.012
3415	LAKE HOPATCONG	0.022	0.120	416.333	13.627	14.900	0.007
3417	LAKE MUSCONETCONG	0.036	0.140	436.000	11.067	6.000	0.010
3419	PAULINS KILL LAKE	0.133	0.950	460.500	7.017	9.000	0.065
3420	SPRUCE RUN RESERVOIR	0.020	0.470	428.667	15.333	15.000	0.007
3422	UNION LAKE	0.063	1.150	463.200	22.080	12.800	0.018
3423	WANAQUE RESERVOIR	0.014	0.120	355.333	7.111	14.800	0.005

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
3402	BUDD LAKE	12 (1)	58 (7)	0 (0)	0 (0)	92 (11)	29 (3)	191
3403	GREENWOOD LAKE	83 (10)	100 (12)	92 (11)	58 (7)	21 (2)	83 (9)	437
3406	ORADELL RESERVOIR	54 (6)	17 (2)	42 (5)	25 (3)	42 (5)	67 (8)	247
3409	PINECLIFF LAKE	33 (4)	67 (8)	17 (2)	8 (1)	67 (8)	42 (5)	234
3410	POMPTON LAKES	25 (3)	33 (4)	33 (4)	17 (2)	58 (7)	8 (1)	174
3412	DUHERNAL LAKE	12 (1)	0 (0)	8 (1)	100 (12)	83 (10)	58 (7)	261
3413	FARRINGTON LAKE	54 (6)	42 (5)	50 (6)	75 (9)	33 (4)	29 (3)	283
3415	LAKE HOPATCONG	75 (9)	87 (10)	83 (10)	50 (6)	8 (1)	83 (9)	386
3417	LAKE MUSCONETCONG	67 (8)	75 (9)	67 (8)	67 (8)	100 (12)	50 (6)	426
3419	PAULINS KILL LAKE	0 (0)	25 (3)	58 (7)	92 (11)	75 (9)	0 (0)	250
3420	SPRUCE RUN RESERVOIR	92 (11)	50 (6)	75 (9)	42 (5)	0 (0)	83 (9)	342
3422	UNION LAKE	42 (5)	8 (1)	25 (3)	33 (4)	50 (6)	17 (2)	175
3423	WANAQUE RESERVOIR	100 (12)	87 (10)	100 (12)	83 (10)	21 (2)	100 (12)	491

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	3423	WANAQUE RESERVOIR	491
2	3403	GREENWOOD LAKE	437
3	3417	LAKE MUSCONETCONG	426
4	3415	LAKE HOPATCONG	386
5	3420	SPRUCE RUN RESERVOIR	342
6	3413	FARRINGTON LAKE	283
7	3412	OUHERNAL LAKE	261
8	3419	PAULINS KILL LAKE	250
9	3406	ORADELL RESERVOIR	247
10	3409	PINECLIFF LAKE	234
11	3402	BUDD LAKE	191
12	3422	UNION LAKE	175
13	3410	POMPTON LAKES	174